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## Description

Spoonable creams are well known in Great Britain. Although the rheological parameters of creams and emulsions are defined in P. Sherman, Emulsion Science, Academic Press 1968, the term spoonable is not defined therein. According to our definition, a spoonable cream should display the following rheological behaviour at 5°C.

- 1) the yield value (also called: yield stress) should be more than 50 Pa extrapolated from shear rates between 100-300 S<sup>-1</sup> (Bingham);
- 2) the Bingham viscosity should be less than 500 mPa s between shear rates of 100-300 S<sup>-1</sup>;
- 3) the failure to stress should occur at a strain of less than 0.5 Radians, preferably less than 0.1 Radians.

Yield values and Bingham viscosities were determined utilising the Carrimed Rheometer. Measurements were performed at 5°C, using 4° cone and plate geometry. The shear stress was increased from zero at a rate of 60 Pa/min, and shear rates were measured until values in excess of 600 s<sup>-1</sup> were achieved. The experiment was then terminated. A graph of shear stress vs shear rate was plotted, and a straight line fitted to the curve between the shear rates of 100-300 s<sup>-1</sup>. The slope of this line was the Bingham viscosity. The yield stress was determined by extrapolation of this line back to zero shear rate.

The failure to stress measurements were determined utilizing the Carrimed Rheometer. Measurements were performed at 5°C, using a 4° cone and plate geometry. The experiments performed were torque sweeps in oscillation mode. The samples were oscillated at a frequency of 1Hz, as the torque was increased from 50-5000 μNm in thirty steps. The measurement time at each torque value was 10 sec, and the time between measurements was 5 sec. The parameters measured were storage modulus (G'), loss modulus (G'') and strain (in radians). A graph of G' and G'' vs strain was then plotted. At low strain values the samples displayed solid-like characteristics, and G' > G''. At higher strain values G'' > G' and the failure to stress was defined as the strain at which G' = G''.

Low fat soured creams, based on dairy fats are known from J. of Dairy Science 86, Ann. Meeting Am. Dairy Sciency Ass 74 (1991), Aug. 12-15, Suppl. 1. These creams contain stabilisers, such as gelatin, modified starch, guar gum, locust bean gum, carrageenan, or pectins. As the rheological parameters are not mentioned, it remains unanswered whether these products meet our criteria for spoonability.

It is further known from DE 1,692,584 that unctuous food products, based on milk protein and vegetable fat (fat contents: 1-50 wt%) can be obtained when the compositions contain edible organic acids and an emulsifier combination and optionally a small amount of gelatin. According to this document it is essential that a combination of different locust bean gums is present. It can not be concluded from this document, whether the rheology of the product makes it spoonable or not.

It is for the purpose of obtaining healthier products, i.e. products containing more unsaturated or at least fewer saturated fatty acid moieties, that attempts have been made to produce a low-fat equivalent of a soured, spoonable dairy cream. However, so far any efforts to produce a soured, spoonable low-fat cream, thus one containing at least a vegetable fat in levels up to 15 wt.% with the desired properties have been unsuccessful: Either the stability or the rheology of the creams was insufficient.

Therefore, so far no low-fat equivalent of a soured, spoonable non-dairy cream with the required properties was available.

We have now found a solution to the problems mentioned above. Therefore, our invention is concerned in the first place with soured, water-continuous creams with the composition and properties as mentioned in claim 1. These creams are free from emulsifiers and comprise 5-15 wt.% of fat, from which at least one is a vegetable fat, optionally mixed with butterfat or fractions thereof, a protein component and a thickener system. These soured creams are stable and spoonable. In this respect, the term stable is defined as: the cream can be stored for at least 14 days at a temperature of 0-15°C, such that the rheology remains within our definition of spoonable, no serum leakage occurs, and the cream remains microbiologically stable.

We have defined spoonable based on standard rheological tests. Such tests have been discussed by Sherman.

The pH of our soured, spoonable non-dairy creams is in general 4.0-4.8, preferably 4.4-4.6.

Although the fat level of our new compositions can range from 5-15 wt.%, it is preferred to use fat levels of less than 10 wt.%.

The fats that can be used in our creams are butterfat and the well-known vegetable fats. Preferred fats, however, are: palmkernel oil, soybean oil, rapeseed oil, coconut oil, sunflower oil, safflower oil, butterfat or fully or partially hardened fractions thereof. It should be noted here that butterfat is only applied in admixture with a vegetable fat.

It is also possible to use indigestible "fats", such as the well-known sucrose poly fatty acid esters (SPE's) as "fat" component in our creams.

The butterfat is preferably present in an amount of 2-10 wt.% calculated on the basis of the total cream.

Although the highest data for yield stress are obtained when firm (i.e. hardened) fat blends are used, it is possible to use fat compositions that are completely liquid. As these liquid fats are normally highest in unsaturated fatty acids, these compositions will be the healthiest.

In order to obtain good taste, the correct acidity level, but also good rheological properties, it is preferred that a protein component be present in our compositions. Very suitable milk protein components are buttermilk powder (B.M.P) and skimmed milk powder (S.M.P).

The amounts of B.M.P and/or S.M.P are suitably between 0.1-10.0 wt.% (calculated on the total cream), preferably between 0.3 and 2.0 wt.%.

Because of the low fat levels of our creams it is difficult to produce a spoonable low-fat non-dairy cream that also displays an acceptable yield stress (i.e. yield stress of more than 50 Pa). We have found that the desired yield stress can be obtained when a thickener system is incorporated into our new creams. The thickeners can be selected from the group consisting of locust bean gum, guar gum, alginate, carrageenan, microcrystalline cellulose, but also starches and hydrolyzed starches can be used.

The starches can be derived from any source, such as rice, maize, potato or tapioca.

The amount of thickener that is required depends on the fat system used. In general, amounts of 0.2-20.0 wt.%, preferably 0.4-10.0 wt.%, give very suitable results (on the basis of the total cream).

Another important factor for the rheological and organoleptic properties of our non-dairy creams is the droplet size of the fat droplets in our emulsions. The droplet size should preferably not be greater than 5.0  $\mu\text{m}$ , more preferably less than 2.0  $\mu\text{m}$ .

A process for the preparation of a soured cream comprises at least the steps of :

- making at least one pre-mix of fat(s), protein component(s), in particular B.M.P and/or S.M.P, thickeners and water or skimmed milk at a temperature of 40-100 °C;
- cooling the pre-mix(es) to 40-70 °C;
- homogenizing the pre-mix(es) in at least a single stage under pressure;
- cooling the homogenized pre-mix(es) to a temperature of 5-30 °C;
- adding to the pre-mix(es) a culture medium capable of converting lactose into lactic acid by fermentation;
- fermenting the pre-mix(es) until a pH = 4.0-4.6;
- where appropriate, mixing the fermented pre-mix(es);
- storing the fermented mixture at a temperature of less than 15 °C, preferably 0-10 °C.

In the above-mentioned process the homogenization pressure is preferably in the range of 10-250 bar. If the pressure is above 100 bar, then a second stage homogenization of 20-100 bar is required.

This process is applied for the preparation of the soured, spoonable non-dairy creams as disclosed above.

#### EXAMPLE I

A non-dairy cream comprising 10 wt% of fat was prepared with the following composition

	wt%
palm kernel oil m.p. 38 °C	10.0
Skimmed milk	78.0
Skimmed milk powder	10.0
Starch	1.5
Thickener (LBG)	0.5

The dry ingredients were dispersed in skimmed milk at 90 °C. The premix was cooled to 60 °C, whereupon the palm kernel oil was added. The emulsion was homogenised at a pressure of 100 bar and pasteurized. It was cooled to 5 °C and stored overnight. 1% of a culture medium was added, and the cream kept at 25 °C for 22 hours. It was finally stored at 5 °C.

The rheological data were as follows:

Extrapol. yield stress	140 Pa
Bingham visc.	145 mPa.s
Failure to stress	0.013 radians

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**EXAMPLE II**

Example I was repeated, except that 10% sunflower oil was used instead of 10% palm kernel-38. The  
 10 rheological data were:

Extrapol. yield stress	179 Pa
Bingham visc.	148 mPa.s
Failure to stress	0.021 radians

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**Claims**

- 20 1. A soured, water-continuous cream that is free from emulsifiers and comprises 5-15 wt.% of fat, from which at least one is a vegetable fat, a protein component and a thickener composition, which soured cream is storage stable for at least 14 days at 0-15 °C and spoonable and displays at 5 °C the following characteristics :
  - 25 a) a yield value of more than 50 Pa extrapolated from shear rates between 100-300 S<sup>-1</sup> (Bingham);
  - b) a Bingham viscosity of less than 500 mPa s between shear rates of 100-300 S<sup>-1</sup>;
  - c) failure to stress at a strain of less than 0.5 Radians.
2. A soured cream according to Claim 1, wherein the pH of the cream is 4.0-4.8.
- 30 3. A soured cream according to Claims 1-2, wherein the fat level is less than 10 wt%.
4. A soured cream according to Claims 1-2, wherein the fat is at least one of the group consisting of butterfat, palmkernel oil, soybean oil, rapeseed oil, coconut oil, sunflower oil, safflower oil, sucrose poly fatty acid esters or fully or partially hardened fractions thereof with the pre-requisite that the fat never  
 35 consists of butterfat or butterfat-fractions only.
5. A soured cream according to Claim 4, wherein the butterfat is present in amounts of 2-10 wt.% of the total cream.
- 40 6. A soured cream according to Claim 1, wherein the fat is a fully liquid oil or a blend of liquid oils.
7. A soured cream according to claims 1-6, wherein the cream contains 0.1-10.0 wt.% of buttermilk powder and/or skimmed milk powder as protein component.
- 45 8. A soured cream according to Claim 7, wherein the level of buttermilk powder and/or skimmed milk powder is 0.3-2.0 wt.%.
9. A soured cream according to Claims 1-8, wherein the droplet size of the fat droplets is less than 5.0 µm, preferably less than 2.0 µm.
- 50 10. A soured cream according to Claims 1-9, wherein 0.2-20.0 wt.%, in particular 0.4-10.0 wt.% (on the basis of the total cream) of a thickener system is present.
11. A soured cream according to Claim 10, wherein the thickener system comprises at least one of the  
 55 compounds : locust bean gum, guar gum, alginate, carrageenan, microcrystalline cellulose or starch.

## Patentansprüche

1. Angesäuerte wasserkontinuierliche Sahne, die frei von Emulgatoren ist und 5 bis 15 Gew.-% Fett, von dem mindestens eines ein pflanzliches Fett ist, eine Proteinkomponente und eine Verdickungsmittelzusammensetzung umfaßt, wobei die angesäuerte Sahne für mindestens 14 Tage bei 0 bis 15 °C lagerbeständig und mit dem Löffel eßbar ist und bei 5 °C die folgenden Eigenschaften zeigt:
  - 1) eine untere Fließgrenze von mehr als 50 Pa, extrapoliert aus Schergeschwindigkeiten zwischen 100 bis 300 S<sup>-1</sup> (Bingham);
  - 2) eine Bingham-Viskosität von weniger als 500 mPa.s zwischen Schergeschwindigkeiten von 100 bis 300 S<sup>-1</sup>;
  - 3) ein Spannungsversagen bei einer Verformung von weniger als 0,5 Radiant.
2. Angesäuerte Sahne nach Anspruch 1, bei der der pH-Wert der Sahne 4,0 bis 4,8 beträgt.
3. Angesäuerte Sahne nach Anspruch 1 bis 2, bei der der Fettgehalt weniger als 10 Gew.-% beträgt.
4. Angesäuerte Sahne nach Anspruch 1 bis 2, bei der das Fett mindestens eines aus der Gruppe ist, die aus Butterfett, Palmkernöl, Sojaöl, Rapsöl, Kokosnußöl, Sonnenblumenöl, Färberdistelöl, Saccharosepolyfettsäureestern oder vollständig oder partiell gehärteten Fraktionen davon besteht, mit der Maßgabe, daß das Fett nie nur aus Butterfett oder Butterfettfraktionen besteht.
5. Angesäuerte Sahne nach Anspruch 4, bei der das Butterfett in Mengen von 2 bis 10 Gew.-%, bezogen auf die gesamte Sahne, vorliegt.
6. Angesäuerte Sahne nach Anspruch 1, bei der das Fett ein vollständig flüssiges Öl oder ein Gemisch flüssiger Öle ist.
7. Angesäuerte Sahne nach einem der Ansprüche 1 bis 6, bei der die Sahne 0,1 bis 10,0 Gew.-% Buttermilchpulver und/oder Magermilchpulver als Proteinkomponente enthält.
8. Angesäuerte Sahne nach Anspruch 7, bei der der Gehalt an Buttermilchpulver und/oder Magermilchpulver 0,3 bis 2,0 Gew.-% beträgt.
9. Angesäuerte Sahne nach einem der Ansprüche 1 bis 8, bei der die Tröpfchengröße der Fetttröpfchen kleiner als 5,0 µm, vorzugsweise kleiner als 2,0 µm, ist.
10. Angesäuerte Sahne nach einem der Ansprüche 1 bis 9, bei der 0,2 bis 20,0 Gew.-%, insbesondere 0,4 bis 10,0 Gew.-%, bezogen auf die gesamte Sahne, eines Verdickungsmittelsystems vorliegen.
11. Angesäuerte Sahne nach Anspruch 10, bei der das Verdickungsmittelsystem mindestens eine der Verbindungen Johannisbrotgummi, Guargummi, Alginat, Carrageenan, mikrokristalline Cellulose oder Stärke umfaßt.

## Revendications

1. Une crème acidifiée avec phase aqueuse continue qui est exempte d'émulsifiants et comprend 5 à 15 % en masse de graisses dont l'une au moins est une graisse végétale, un composant protéiné et une composition d'agents épaississants, laquelle crème acidifiée est stable au stockage pendant une durée d'au moins 14 jours à une température comprise entre 0 et 15 °C, est mangeable à la cuillère, et présente les caractéristiques suivantes à une température de 5 °C :
  - a) une valeur de débit supérieure à 50 Pa, extrapolée des gradients de cisaillement compris entre 100 et 300 S<sup>-1</sup> (Bingham) ;
  - b) une viscosité Bingham inférieure à 500 mPa.s et comprise dans des gradients de cisaillement situés entre 100 et 300 S<sup>-1</sup> ;
  - c) une rupture à la contrainte se produisant à un niveau de contrainte inférieur à 0,5 radian.
2. Une crème acidifiée selon la Revendication 1, dans laquelle le pH de la crème est compris entre 4,0 et 4,8.

3. Une crème acidifiée selon les Revendications 1 et 2, dans laquelle la teneur en graisse est inférieure à 10 % en masse.
- 5 4. Une crème acidifiée selon les Revendications 1 et 2, dans laquelle la graisse est au moins l'une des graisses du groupe composé de graisse de beurre, d'huile de palmiste, d'huile de soja, d'huile de colza, d'huile de noix de coco, d'huile de tournesol, d'huile de carthame, de poly-esters d'acides gras de saccharose ou de fractions tout ou partie durcies de ceux-ci, sous réserve que la graisse n'est pas seulement constituée de graisse de beurre ou de fractions de graisse de beurre uniquement.
- 10 5. Une crème acidifiée selon la Revendication 4, dans laquelle la graisse de beurre est présente dans une proportion comprise entre 2 et 10 % en masse de la crème totale.
6. Une crème acidifiée selon la Revendication 1, dans laquelle la graisse est une huile complètement liquide ou un mélange d'huiles liquides.
- 15 7. Une crème acidifiée selon les Revendications 1 à 6, dans laquelle la crème contient 0,1 à 10,0 % en masse de poudre de babeurre écrémé et/ou de poudre de lait écrémé en tant que composant protéiné.
- 20 8. Une crème acidifiée selon la Revendication 7, dans laquelle la teneur en poudre de babeurre et/ou de poudre de lait écrémé est comprise entre 0,3 et 2,0 % en masse.
9. Une crème acidifiée selon les Revendications 1 à 8, dans laquelle la taille des gouttes de graisse est inférieure à 5,0  $\mu\text{m}$ , de préférence inférieure à 2,0  $\mu\text{m}$ .
- 25 10. Une crème acidifiée selon les Revendications 1 à 9, dans laquelle est présent un système d'agents épaississants à raison de 0,2 à 20,0 % en masse, en particulier 0,4 à 10,0 % en masse (sur la base de la crème totale).
- 30 11. Une crème acidifiée selon la Revendication 10, dans laquelle le système d'agents épaississants comprend au moins un des composés suivants : de la gomme de graine de caroube, de la gomme de guar, de l'alginate, des carraghènes, de la cellulose microcristalline ou de l'amidon.

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